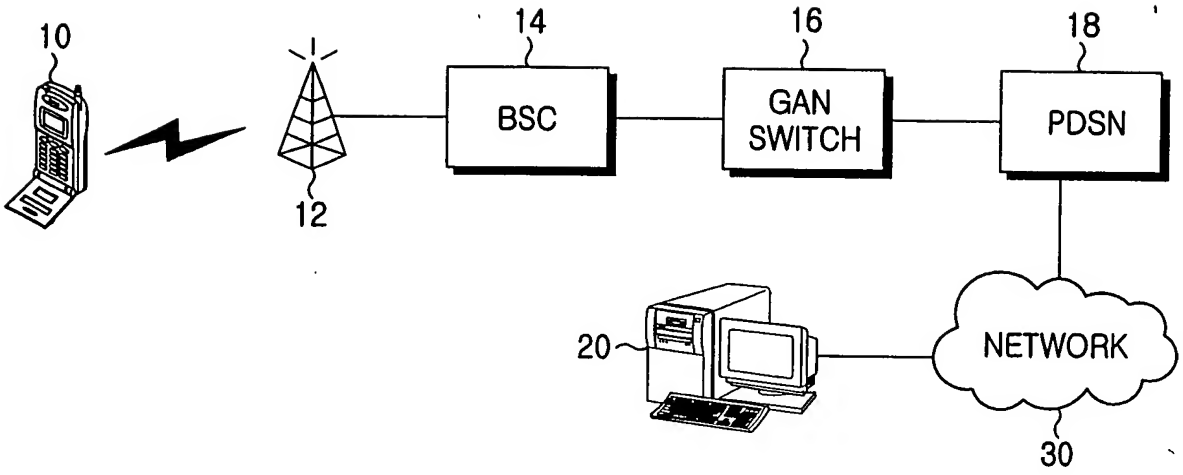

FIG.1

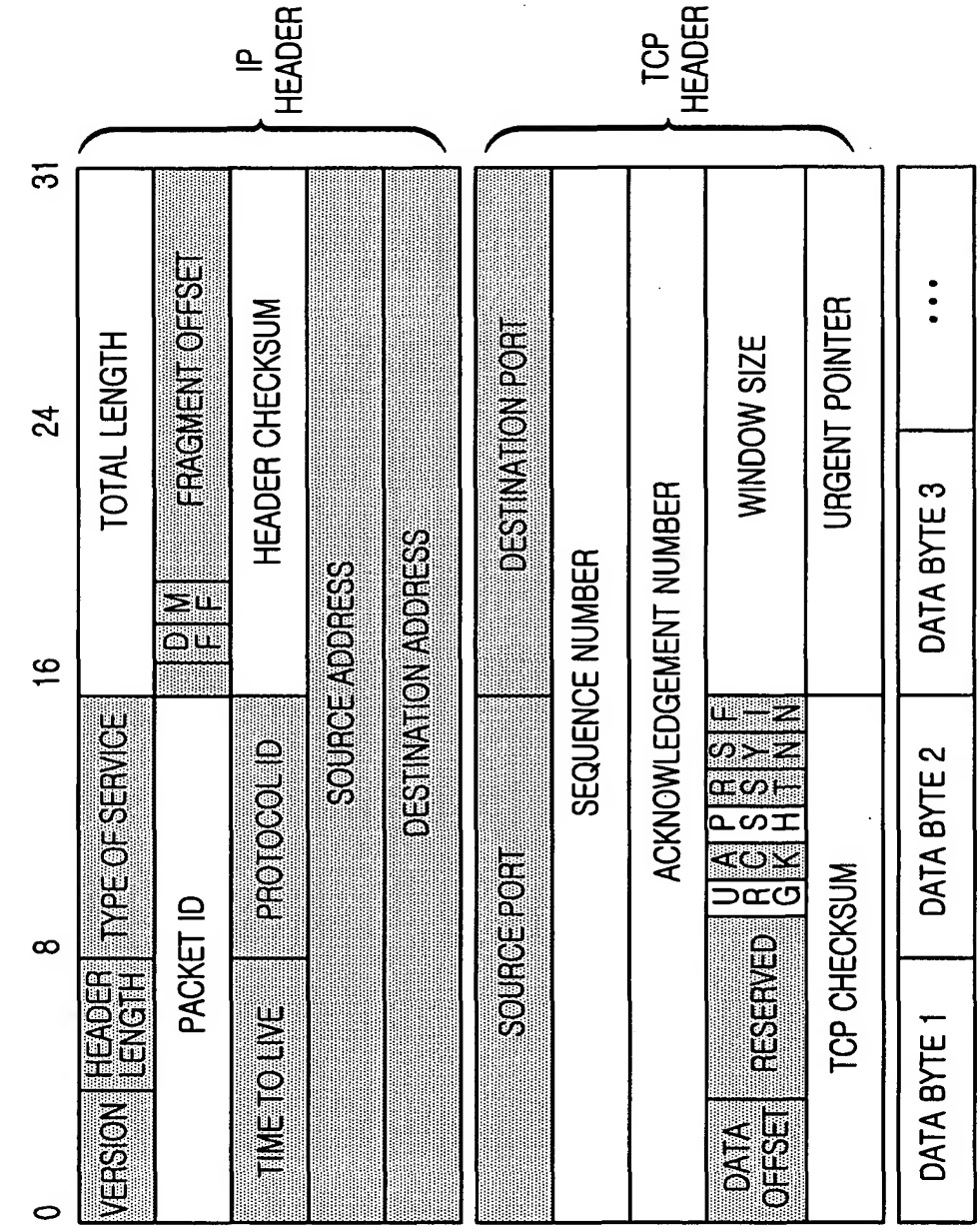
0
8
16
24
31
VERSION
HEADER LENGTH
TYPE OF SERVICE
TOTAL LENGTH
PACKET ID
D F
M F
FRAGMENT OFFSET
TIME TO LIVE
PROTOCOL ID
HEADER CHECKSUM
SOURCE ADDRESS
DESTINATION ADDRESS
IP HEADER
SOURCE PORT
DESTINATION PORT
SEQUENCE NUMBER
ACKNOWLEDGEMENT NUMBER
DATA OFFSET
RESERVED
U R G
A C K
P S H
R S T
S Y N
F I N
WINDOW SIZE
TCP CHECKSUM
URGENT POINTER
TCP HEADER
DATA BYTE 1
DATA BYTE 2
DATA BYTE 3
...

FIG.2

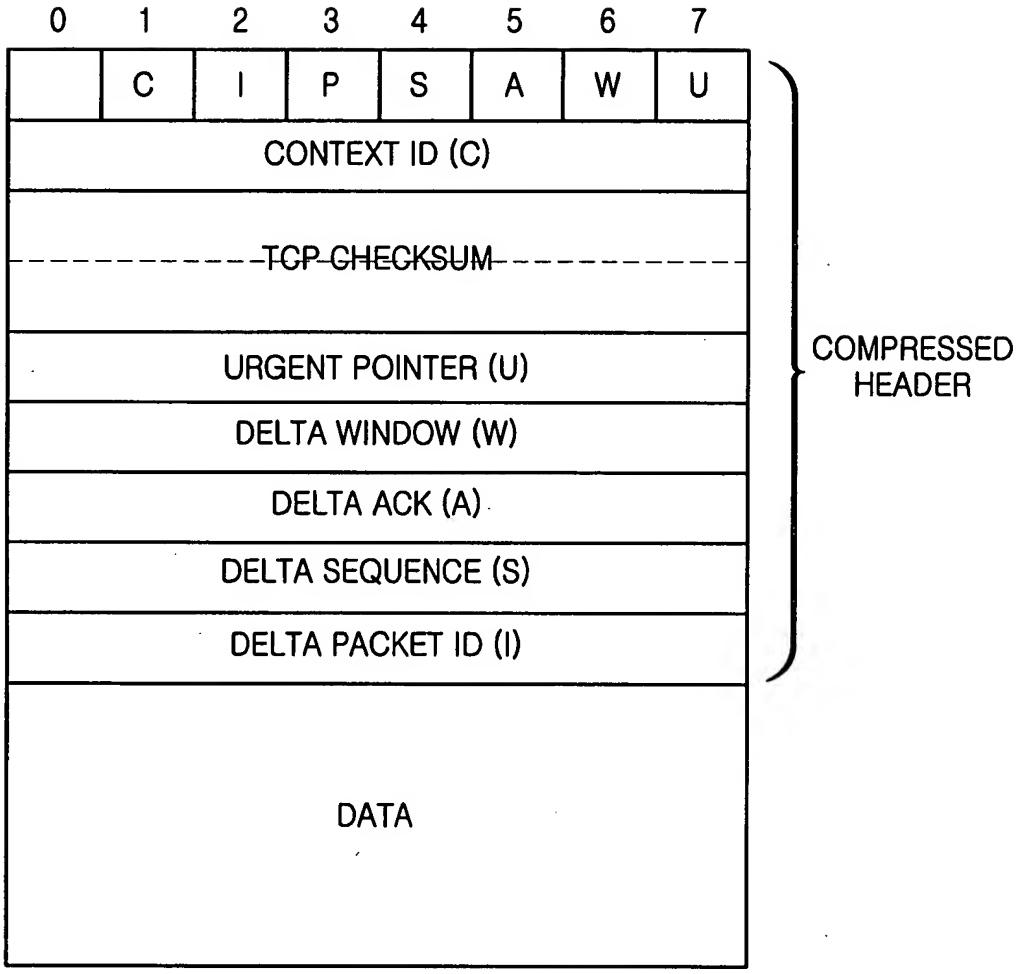
0
1
2
3
4
5
6
7
C
I
P
S
A
W
U
CONTEXT ID (C)
TCP CHECKSUM
URGENT POINTER (U)
DELTA WINDOW (W)
DELTA ACK (A)
DELTA SEQUENCE (S)
DELTA PACKET ID (I)
DATA
COMPRESSED HEADER

FIG.3

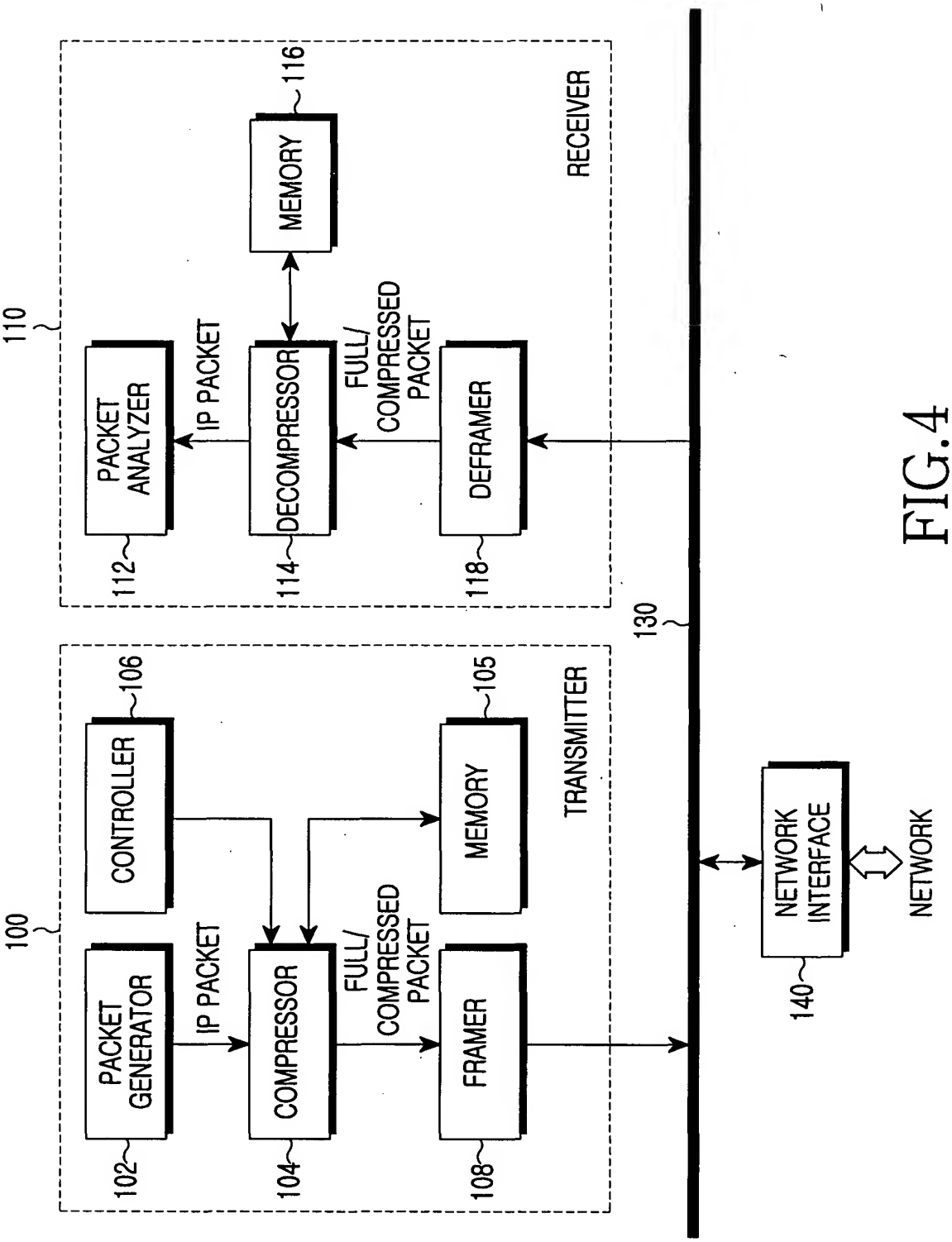
100
TRANSMITTER
CONTROLLER
106
PACKET GENERATOR
102
IP PACKET
COMPRESSOR
104
FULL/ COMPRESSED PACKET
MEMORY
105
FRAMER
108
110
RECEIVER
MEMORY
116
PACKET ANALYZER
112
IP PACKET
DECOMPRESSOR
114
FULL/ COMPRESSED PACKET
DEFRAMER
118
130
NETWORK INTERFACE
140
NETWORK

FIG.4

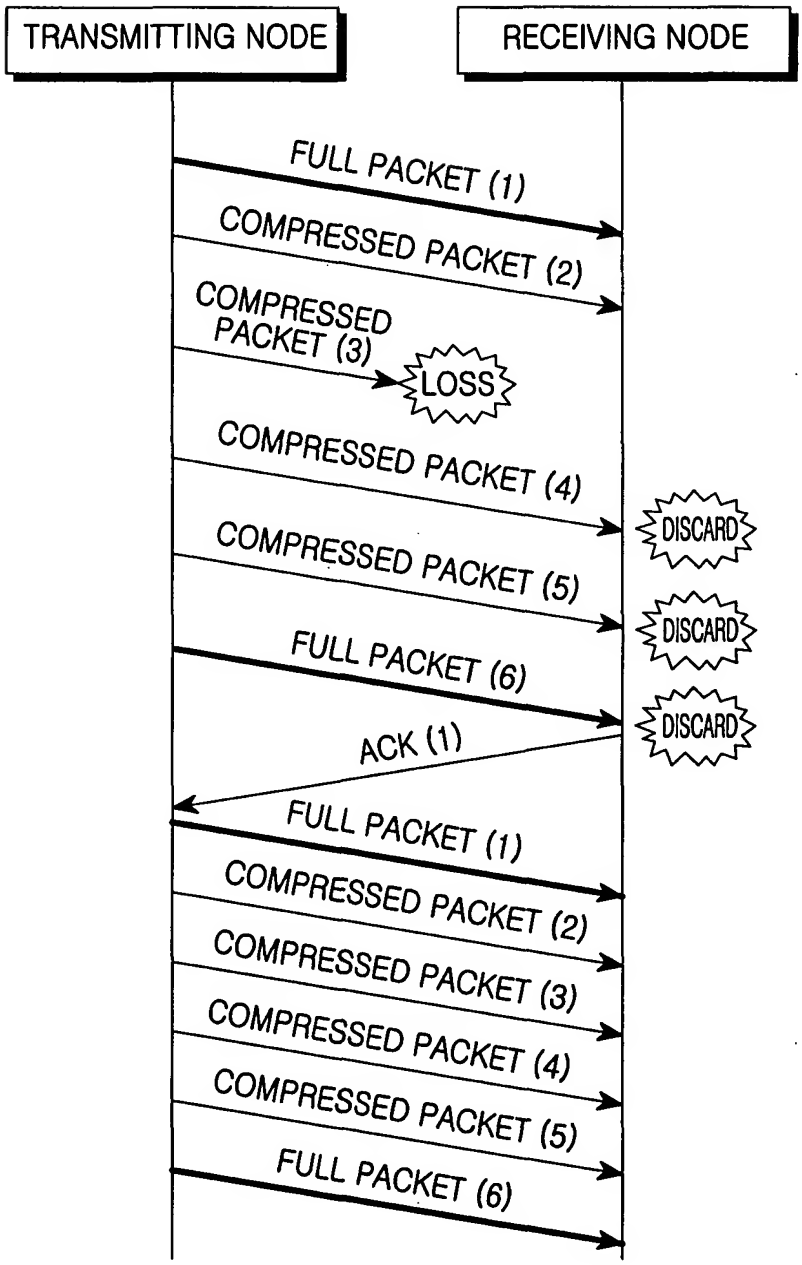
TRANSMITTING NODE
RECEIVING NODE
FULL PACKET (1)
COMPRESSED PACKET (2)
COMPRESSED PACKET (3)
LOSS
COMPRESSED PACKET (4)
DISCARD
COMPRESSED PACKET (5)
DISCARD
FULL PACKET (6)
DISCARD
ACK (1)
FULL PACKET (1)
COMPRESSED PACKET (2)
COMPRESSED PACKET (3)
COMPRESSED PACKET (4)
COMPRESSED PACKET (5)
FULL PACKET (6)

FIG.5

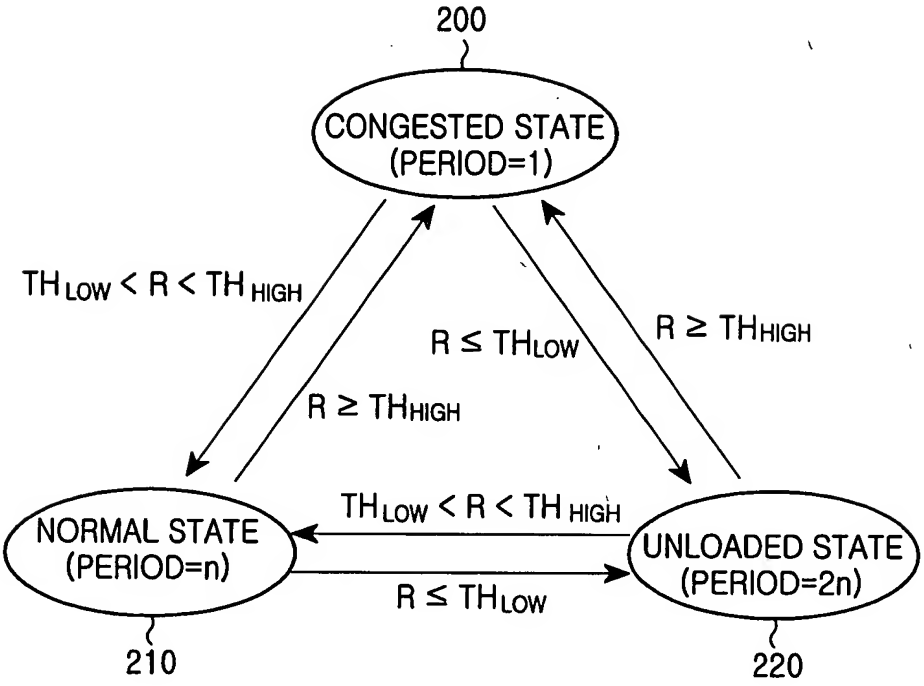
200
CONGESTED STATE
(PERIOD=1)
TH LOW < R < TH HIGH
R ≤ THLOW
R ≥ THHIGH
R ≥ THHIGH
TH LOW < R < TH HIGH
NORMAL STATE
(PERIOD=n)
UNLOADED STATE
(PERIOD=2n)
R ≤ THLOW
210
220

FIG.6

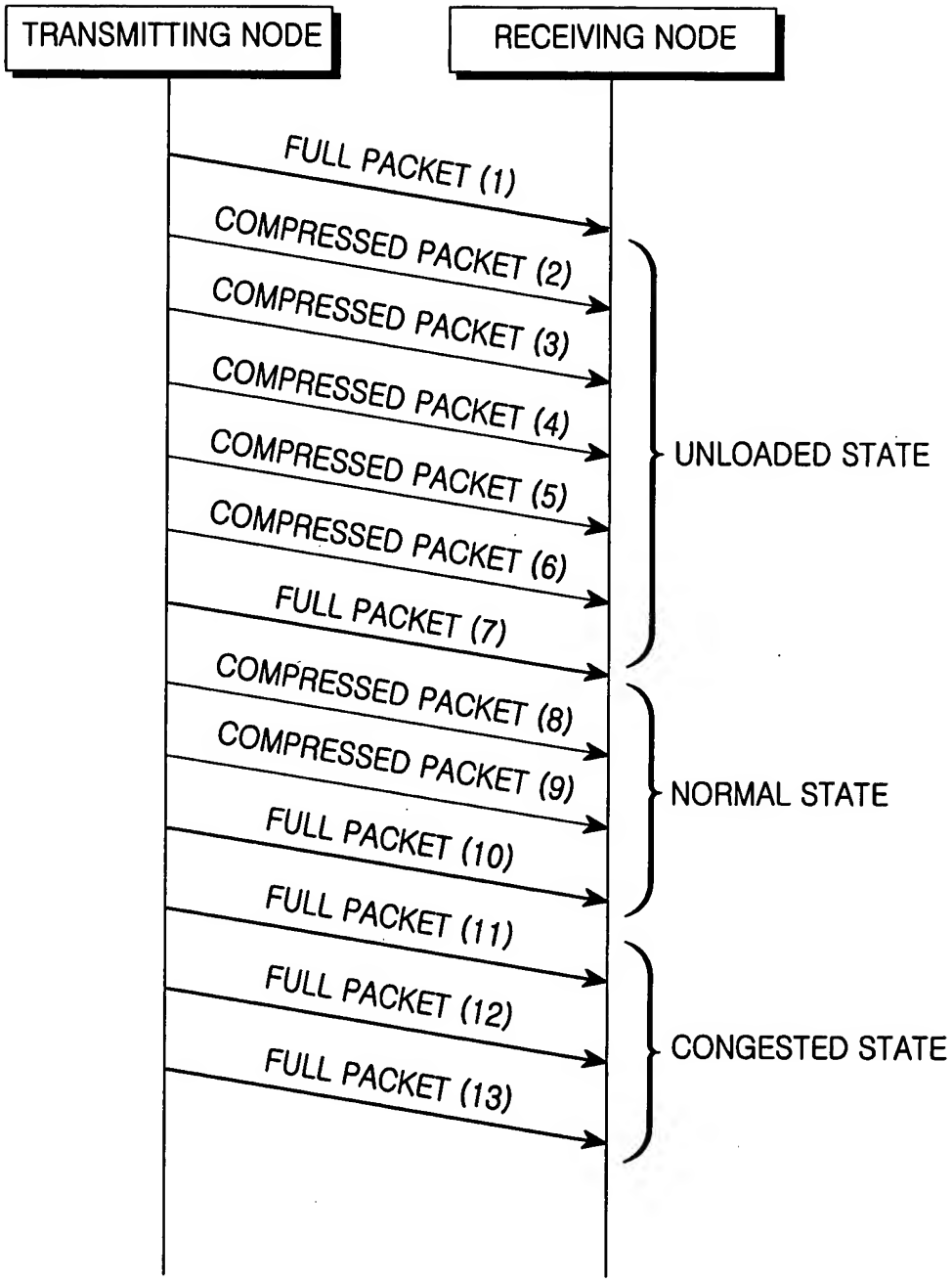
TRANSMITTING NODE
RECEIVING NODE
FULL PACKET (1)
COMPRESSED PACKET (2)
COMPRESSED PACKET (3)
COMPRESSED PACKET (4)
COMPRESSED PACKET (5)
COMPRESSED PACKET (6)
FULL PACKET (7)
UNLOADED STATE
COMPRESSED PACKET (8)
COMPRESSED PACKET (9)
FULL PACKET (10)
NORMAL STATE
FULL PACKET (11)
FULL PACKET (12)
FULL PACKET (13)
CONGESTED STATE

FIG.7

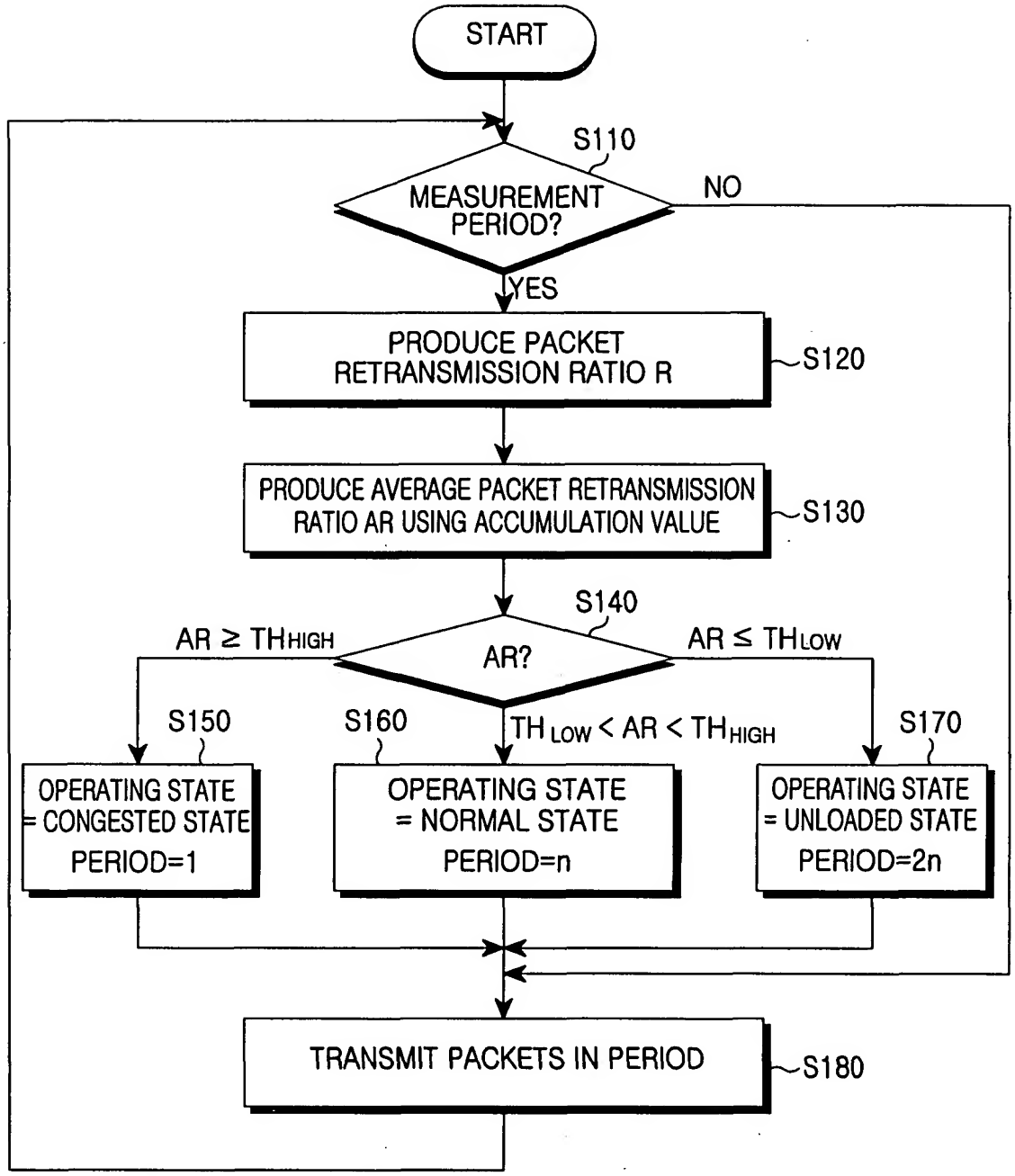
START
S110
MEASUREMENT PERIOD?
NO
YES
PRODUCE PACKET RETRANSMISSION RATIO R
S120
PRODUCE AVERAGE PACKET RETRANSMISSION RATIO AR USING ACCUMULATION VALUE
S130
S140
AR?
AR ≥ THHIGH
AR ≤ THLOW
THLOW < AR < THHIGH
S150
S160
S170
OPERATING STATE = CONGESTED STATE PERIOD=1
OPERATING STATE = NORMAL STATE PERIOD=n
OPERATING STATE = UNLOADED STATE PERIOD=2n
TRANSMIT PACKETS IN PERIOD
S180

FIG.8

```
      #define ALPHA 0.75
      #define TH_HIGH 0.10
      #define TH_LOW 0.05
      // PRODUCE PACKET RETRANSMISSION RATIO (NUMBER OF RETRANSMITTED
         PACKETS/NUMBER OF TRANSMITTED PACKETS) EVERY 5 SECONDS.
(S120) R = RetransPkts / SentPkts ;

      // PRODUCE AVERAGE PACKET RETRANSMISSION RATIO USING
         LOW-PASS-FILTER FORMULA.
(S130) AR = (1-ALPHA)*AR
           +ALPHA * R;

      // CLASSIFY THREE OPERATING STATES ACCORDING TO PACKET
         RETRANSMISSION RATIO, AND DECIDE WHEN FULL PACKET MUST BE
         TRANSMITTED ACCORDING TO EACH OPERATING STATE
       if (AR >= TH_HIGH) {
(S150)     State = Congested;
           Period = 1;
         } else if (AvgRetransRate <= TH_LOW) {
(S170)     State =unloaded;
           Period = 2n;
         } else
(S160)     State = Loaded;
           Period =n;
         }

      // TRANSMIT FULL PACKET IN PERIOD.
(S180) for (i=1; i<=Period; i++) {
           if (i == Period)
              send full packets;
           else
              send compressed packets;
         }
```

FIG.9